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A Short Empirical Note on Household Debt, Financialization, and Macroeconomic Performance

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Abstract

We empirically examine the relationship between U.S. output and household debt. To account for structural change due to financial liberalization, we divide the sample at the fourth quarter of 1982. We find structural differences between earlier and later business cycles for the U.S. household sector and its relation to the macroeconomy. In the regression analysis for pre-1982, we find no evidence that the household debt variables had any negative effect on output. However, we find some evidence that the household debt variables have negative effects on output for the post-1982 period. A formal structural break test provides evidence of a structural change in the relationship of U.S. output to household debt. Unit root tests for the separate samples show that none of the household variables possesses a unit root in the earlier period, yet all of them do in the later period, indicating fundamental differences between earlier and later periods in terms of the data generating process.

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1 Introduction

The U.S. recently experienced a significant increase in household debt. Household debt outstanding as a share of GDP, for example, increased from about 45 percent in 1975 to nearly 100 percent in 2006 (See figure 1). The household debt burden increased as well. Figures 2 depicts two measures of the debt service burden: household financial obligations as a percent of disposable personal income and household debt service payments as a percent of disposable personal income. These series have been considered important debt burden measures and used by the Federal Reserve as primary measures of the household debt burden (Greenspan, 2004).[1] Both measures also show upward trends, indicating that households' financial positions have continuously been worsened.

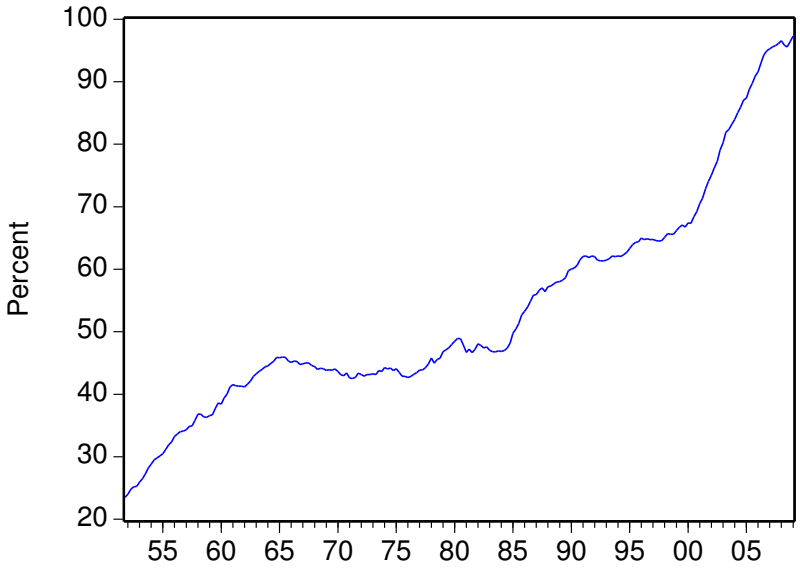

Figure 1: Household Debt-GDP Ratio (1951Q4-2009Q1)

[1]These two series are available starting in 1980. The debt service ratio measures the share of income committed by households for paying interest and principal on their debt. The financial obligations ratio, in addition to including debt payments, incorporates households' other recurring expenses—such as rents, auto leases, homeowners' insurance and property taxes—that may be subtracted from the uncommitted income available to households (Greenspan, 2004).

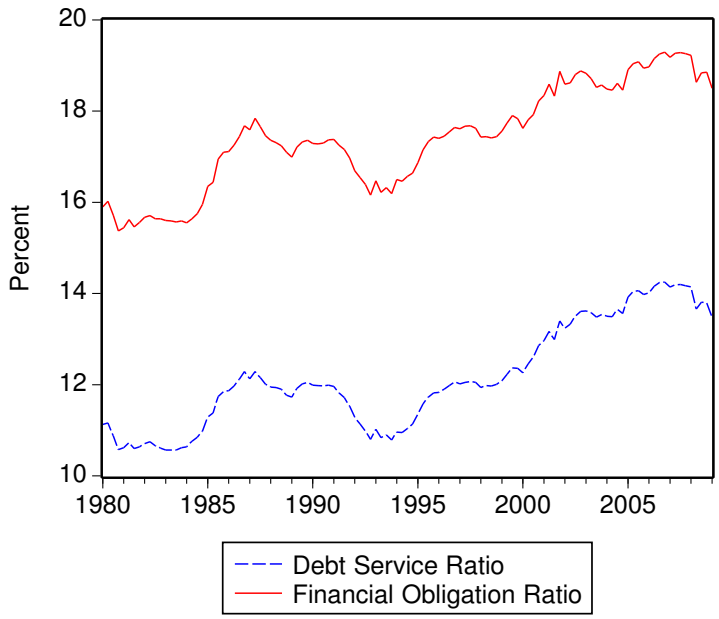

Figure 2: Debt Service and Financial Obligation Ratios (1980Q1-2009Q1)

Cynamon and Fazzari (2008) provide an informative discussion of this accumulation of household debt from the perspective of Hyman Minsky' financial instability hypothesis.[2] They point out that, while household debt accumulated, household expenditure increased considerably as well. For example, the ratio of personal outlays to disposable income has increased from about 88 percent in the early 1980s to nearly 100 percent in 2007. Cynamon and Fazzari argue that, although debt-financed household expenditure provided a substantial macroeconomic stimulus between the 1980s and the early 2000s, this unprecedented rise in household debt could have planted the seeds for financial instability and a nontrivial economic downturn as indeed later occurred.

However empirical studies of the impact of household debt on macroeconomic performance has been scarce. Palley (1994) is a rare empirical study that analyzes household debt and business cycles from the heterodox perspective—specifically, from the perspective

[2]The financial instability hypothesis originally emphasize firms's investment financing behavior. Minsky argues that a prolonged period of prosperity will induce euphoric expectations, leading firms to adopt riskier and riskier financial stances. As the average firm evolves from "hedge" to largely "speculative" and even "Ponzi" finance, the economy becomes systemically fragile and susceptible to a sudden financial crisis.

of Minsky's financial instability hypothesis. Palley argues that an increase in debt (new borrowing) raises the gross national product (GNP), and that an increase in the debt service burden reduces GNP, based on an autoregressive distributed lag model.[3]

Palley's unstructured vector autoregression (VAR) model of changes in consumer debt, consumer debt burden, and GNP shows that a shock to the change in consumer debt and the consumer debt burden generates an initial positive and negative GNP response respectively, both followed by a cyclical and damped response.[4] Palley, based on these results, emphasizes consumer debt and its burden as a source of cyclical variations.[5]

Since Palley's study is unique in studying the relationship between household debt and the business cycle from a heterodox perspective, it provides a natural point of departure for our empirical study. We extend and improve the work of Palley. To account for the period of financial liberalization, we will test for a structural break in the relationship of household debt to aggregate output between pre-1980 and post-1980 periods in the U.S. macroeconomy. Based on the test, we estimate the relationship of household debt to aggregate output separately for pre-1982 and post-1982 in the U.S. macroeconomy. We also perform unit root tests, which are an important diagnostic of data for a time-series analysis. (This diagnostic is absent in Palley's work.) More broad measures of household indebtness are also used in this extended study. Our data span is longer, as it includes the more recent period. We use GDP, which is the main measure of economic output used today, instead of GNP used by Palley.[6]

[3]There are few empirical studies that provide rather inconsistent evidence for Palley's results. Garner (1996) and Schmitt (2000) find that some macroeconomic indicators (e.g., real GDP) predict the various consumer debt measures in the Granger causality sense, but not the reverse. The Granger approach tests whether past values of one variable can improve the prediction of the value of another variable. Regressors in Palley's regression are all past values (lagged). The results by Palley and Schmitt therefore provide somewhat conflicting information.

[4]All the variables in Palley's empirical analysis are in real, per capita terms.

[5]We attempted to replicate Palley's regression and VAR results. Although we could not obtain the exact data set Palley used, our replication results are similar to Palley's results.

[6]The gross national product (GNP) was the main macroeconomic aggregate used in the US at the time of Palley's study. Since the time of Palley's study, the US has switched from using GNP to GDP as the main macroeconomic aggregate indicator.

2 Empirical Analysis

We study the empirical relationship between the level of output and measures of household debt in the U.S. economy. The household and consumer debt variables are from the Flow of Funds Accounts of the United States, and are deflated by the personal consumption price index from the Bureau of Economic Analysis (BEA). Output is measured by real GDP. We use real fixed private investment for the investment variable. Both series are from BEA.[7] (See the data appendix for the further information.)

First, we tested household debt, consumer debt, household net worth, output, and investment for unit roots using augmented Dickey-Fuller (ADF) test statistics. We specified a constant and linear time trend, and lag lengths were determined by the Schwarz Information Criterion (SIC). According to the tests, all household variables, investment, and output have unit roots for the entire sample period, 1951Q4-2009Q1.

We use an ADL model in which the right-hand side variables are entered into both level and first differenced form in our regression specification.[8] We utilize this empirical approach since ADL models are known to be robust to many estimation problems related to non-stationary variables (e.g., spurious regression results) (Hamilton, 1994, pp. 561-562). All the explanatory variables are lagged to prevent the problems of simultaneity and reverse causality. The lagged terms are limited to one period (i.e., $t-1$) since additional lags of the explanatory variables increase multicollinearity problems and complicate the estimation.[9]

[7] All data are seasonally adjusted except household net worth. The Fed flow of funds does not have seasonally adjusted household net worth series.

[8] This specification can be interpreted as a variant of dynamic Ordinary Least Square (DOLS), suggested by Stock and Watson (1993) as a method that is robust to the inclusion of nonstationary and possibly cointegrated data. In the Stock-Watson DOLS method, the coefficients on the variables in levels can be interpreted as the long-run relationships.

[9] A similar empirical modeling strategy was adopted by Stockhammer (2004), who explores the linkage between financialization and capital accumulation.

The dependent variable is the level of output (GDP). The baseline model is the following:

$$\begin{aligned} output &= \beta_0 + \beta_1 output_{t-1} + \beta_3 networth_{t-1} + \beta_4 \Delta networth_{t-1} \\ &+ \beta_5 householddebt_{t-1} + \beta_6 \Delta householddebt_{t-1} + \beta_7 consumerdebt_{t-1} \\ &+ \beta_8 \Delta consumerdebt_{t-1} + \varepsilon_t \end{aligned} \tag{1}$$

The real debt burden is proxied by the level of debt accumulation. The change in debt stock represents flow borrowing, which should provide an additional source of household expenditure.[10] Therefore, our hypotheses are that the change in household debt has a positive effect, but the level of debt has a negative effect on output so $\beta_6, \beta_8 > 0$ and $\beta_5, \beta_7 < 0$. A main channel through which debt can influence GDP is the balance sheet effect via consumption. To isolate the effect of household debt on output, we therefore control for household net worth. We hypothesize that both the level and change in net worth have positive effects on output so $\beta_3, \beta_4 > 0$. Table 1 reports the regression results for the entire sample period (1951Q4-2009Q1). We utilize the Godfrey–Breusch Lagrange Multiplier (LM) test for serial correlation in the residuals. We also utilize the ARCH LM test for autoregressive conditional heteroscedasticity (i.e., volatility clustering) in the residuals. The LM test for serial correlation is done with a two-period lag specification, and a one-period lag specification is used for the ARCH test. Model 1 is the baseline specification, which is used to narrow down the number of parameters based on the t-values of the coefficients. After narrowing down the variables using model 1, model 2 reports regressions with levels and first differences of household debt and net worth. This is intuitively plausible since consumer debt is only one component of household debt.

In model 2, we can see that all the variables have the expected signs and are statistically

[10] Our specification is somewhat different from Palley's specification. In Palley's work, the real debt burden is proxied by the level of real per capita consumer installment debt multiplied by the ex post real prime rate. Similar, but more broadly defined debt burden measures are incorporated in the section 2.2. Palley also incorporates a nominal debt burden measure, nominal prime interest rate, and a measure of inflation tax as regressors. We drop these variables since our variables are all real, and our focus is on the impact of the real value of debt accumulation to the real GDP.

Table 1: ADL Regressions: Sample period 1951Q4-2009Q1

	Model1	Model2	Model3
Constant	-14962.89	-11145.54	-23310.51*
	(-1.168)	(-0.948)	-1.75
Real GDP$_{t-1}$	1.009***	1.002***	1.009***
	(127.622)	(165.039)	(162.65)
Household debt$_{t-1}$	-0.02**	-0.03***	-0.022***
	(-2.555)	(-4.724)	(-3.477)
Change in household debt$_{t-1}$	0.264***	0.254***	0.289***
	(2.671)	(3.211)	(3.474)
Consumer debt$_{t-1}$	-0.084		
	(-1.561)		
Change in consumer debt$_{t-1}$	0.390		
	(1.254)		
Net worth$_{t-1}$	0.006***	0.006***	0.01***
	(2.921)	(3.06)	(3.80)
Change in net worth$_{t-1}$	0.014***	0.014***	0.003
	(2.776)	(2.864)	(0.701)
Investment$_{t-1}$			-0.185***
			(-3.318)
Change in investment$_{t-1}$			1.038***
			(6.342)
Adjusted R-squared	0.999	0.999	0.999
Godfrey-Breusch LM (2)	3.115	4.264	2.316
	0.046	0.015	0.101
ARCH(1)	1.998	1.305	1.152
	0.159	0.255	0.284

*, **, and *** denote significance at 10, 5 and 1 percent levels, respectively. t-statistics in parentheses.
Notes: Dependent variable: real GDP. Figures for the LM and ARCH tests are F-statistics with p-values.

significant at conventional levels. There is, however, the possibility of serial correlation according to the Godfrey–Breusch LM test for two lags at the 5 percent significance level. In model 3, we controlled for the level and first difference in investment. We see that this corrects for the serial correlation problem, and the qualitative results of model 2 are mostly preserved. However, the level of investment has a negative coefficient, which is counterintuitive.[11]

[11]This may be due to the multicollinearity between investment and household debt, since household debt includes mortgage debt and private fixed investment includes residential construction.

2.1 Structural Breaks and Unit Roots

Our sample includes the period of "neoliberal revolution" and financial liberalization starting in the late 1970s/early 1980s (Stockhammer, 2004). In the heterodox economics literature, this era is often referred to as the beginning period of "financialization."[12] To test for this source of structural change, we have checked the stability of regression models 2 and 3 using structural break tests. We first utilized the Quandt-Andrews unknown breakpoints test for the period between the middle 1970s and late 1980s. The results showed no evidence of a break. However, when we tested for structural breaks using the Chow break test for individual quarters starting from the middle 1970s, both models reveal structural break points. Furthermore, the break points are spread out. In model 2, we found that in most quarters starting in 1978Q3, the Chow tests show significant statistics for a break at conventional levels. Interestingly, the F-statistics reach a maximum at 2000Q2. The results for model 3 reveal a significant break in each quarter between 1982Q1 and 1986Q2, at conventional levels. The F-statistics reach a maximum at 1983Q4. We interpret the results that break points are spread out over a period as a gradual structural change.[13]

Table 2: Chow structural break tests: 1951Q4-2009Q1

Equation	Time	F-statistics	p-value
Model 2	1982Q4	3.301	0.0067
	1983Q1	3.423	0.0053
Model 3	1982Q4	2.596	0.0136
	1983Q1	2.600	0.0135

Notes: The null hypothesis is that there is no structural break.

To clarify the structural change between the earlier and later periods, we divide the sample at the fourth quarter of 1982. This quarter is chosen because the NBER reports

[12]Palley (2007) defines financialization as "a process whereby financial markets, financial institutions, and financial elites gain greater influence over economic policy and economic outcomes." Epstein (2005) similarly defines financialization as "the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies."

[13]It is interesting to note that Stockhammer (2004) did not find structural break points in 1980 using the Chow break test in his work on financialization. His regression analysis is on the linkage between a measure of financialization and capital accumulation.

November 1982 as the trough of the business cycle period of July 1981-November 1982. The Chow break test results for 1982Q4 and 1983Q1 for models 2 and 3 are reported in table 2.

Table 3: Unit roots tests for the separated samples

	1951Q4-1982Q4	1983Q1-2009Q1
Real GDP	-2.547	-1.628
	0.305	0.775
Household debt	-4.198***	-1.678
	0.006	0.754
Mortgage debt	-3.938**	-1.713
	0.013	0.739
Consumer debt	-4.131***	-1.898
	0.008	0.648
Net worth	-3.467**	-2.741
	0.048	0.223
Investment	-2.962	0.002
	0.147	0.996
Financial obligation ratio		-2.255
		0.453
Debt service ratio		-1.815
		0.69

*, **, and *** denote significance at 10, 5 and 1 percent respectively. ADF test statistics with p-values are reported .
Tests are based on ADF statistic. The null hypothesis is that the variable has a unit root.

Table 3 reports results examining the unit root properties of the variables in this divided sample. We tested the variables for unit roots using ADF test statistics. We specified a constant and linear time trend, and lag lengths were determined by the SIC. For the later cycles, we include the financial obligation and debt service ratios in our tests.

We observe interesting differences between the earlier and later periods. We find that, for the later cycles, all variables have a unit root. However, in the earlier cycles, we observe that none of the household variables (i.e., net worth, household debt, consumer debt, and mortgage debt) show evidence of a unit root. This finding is also evidence that structural changes occurred in US economy—particularly in the household sector.

2.2 Sub-periods

Table 4 reports the results for the earlier period (1951Q4-1982Q4), while table 5 reports the regression results for the later period (1983Q1-2009Q1). Regression specifications presented in models 2 and 3 from table 1, which were estimated for the entire period, are also estimated for the separated samples in tables 4 and 5. The results from model 2 in table 4 show that the changes in household debt and net worth, and the level of net worth are significant with the expected positive signs, but the level of household debt is not significant in the earlier period. However, in the later period (table 5), all the household debt variables are significant with the expected signs. The household debt level has a negative coefficient, while all the other variables are positive and significant.

In model 3 for both periods, we observe that the coefficients for many of the household debt variables lose significance. In the later period, only the change in household debt and the level of net worth are significant, and only the change in net worth is significant for the earlier period regression.[14] In model 3, the level of investment has a significant negative coefficient for the earlier period, but is not significant for the later period. We also observe that introducing the level and first difference of investment into the regression corrects the serial correlation problem in the later period, as in the regression for the whole period.

For the later period, we can also control for two household debt burden measures: household financial obligations as a percent of disposable personal income and household debt service payments as a percent of disposable personal income. Table 5 reports the results from models that incorporate these measures of the debt burden. Models 4 and 5 are the same as model 2 with the debt burden measures included. We observe that all household debt variables, except the change in net worth, are significant with the expected signs—including the negative coefficient on the level of household debt. The debt service burdens, in both level and change, have negative effects on output. They have significant negative

[14]For the later period, the coefficient on the level of household debt is sensitive to the inclusion of a constant in the regression. Without a constant, this variable has a significant negative coefficient as in model 2.

Table 4: ADL Regression: 1951Q4-1982Q4

	Model2	Model3
Constant	-4068.984	-3682.116
	(-0.099)	(-0.077)
Real GDP$_{t-1}$	0.941***	0.987***
	(31.201)	(25.699)
Household debt$_{t-1}$	0.005	0.041
	(0.098)	(0.740)
Change in household debt$_{t-1}$	0.785***	0.416
	(3.586)	(1.346)
Net worth$_{t-1}$	0.018*	0.01
	(1.757)	(1.016)
Change in net worth$_{t-1}$	0.045**	0.045***
	(2.609)	(2.629)
Investment$_{t-1}$		-0.302**
		(-1.900)
Change in Investment$_{t-1}$		1.012***
		(2.779)
Adjusted R-squared	0.999	0.998
LM (1)	0.339	1.235
	0.714	0.295
ARCH(2)	0.257	0.450
	0.613	0.504

*, **, and *** denote significance at 10, 5 and 1 percent, respectively. T-statistics in parentheses.
Notes: Dependent variable: real GDP. Figures for the LM and ARCH tests are F-statistics with p-values.

Table 5: ADL regression: 1983Q1-2009Q1

	Model2	Model3	Model4	Model5	Model6	Model7
Constant	97398.04*	86350.82	379828.7**	377247.9***	74652.86	150753.9
	(1.830)	(1.351)	(2.201)	(2.636)	(0.411)	(0.916)
Real GDP$_{t-1}$	0.978***	0.982***	0.980***	0.974***	0.978***	0.977***
	(67.590)	(57.787)	(69.805)	(68.439)	(56.809)	(54.484)
Household debt$_{t-1}$	-0.023***	-0.013	-0.021***	-0.016*	-0.013	-0.012
	(-2.837)	(-1.425)	(-2.639)	(-1.692)	(-1.467)	(-1.159)
Change in household debt$_{t-1}$	0.214**	0.223**	0.307***	0.359***	0.238**	0.257**
	(2.344)	(2.262)	(3.275)	(3.611)	(2.327)	(2.472)
Net worth$_{t-1}$	0.008***	0.008**	0.009***	0.009***	0.008**	0.007**
	(3.251)	(2.563)	(3.518)	(3.637)	(2.359)	(2.273)
Change in net worth$_{t-1}$	0.011*	0.002	0.008	0.007	0.002	0.002
	(1.899)	(0.425)	(1.497)	(1.309)	(0.430)	(0.448)
Investment$_{t-1}$		-0.067			-0.038	-0.022
		(-0.833)			(-0.456)	(-0.249)
Change in Investment$_{t-1}$		1.023***			0.966***	0.926***
		(4.915)			(4.054)	(3.894)
Financial obligation ratio$_{t-1}$			-18808.21*		1798.180	
			(-1.703)		(0.156)	
Change in financial obligation ratio$_{t-1}$			-65182.30**		-42228.64	
			(-2.190)		(-1.452)	
Debt service ratio$_{t-1}$				-26613.07**		-4438.265
				(-2.151)		(-0.335)
Change in debt service ratio$_{t-1}$				-79074.87**		-57896.48
				(-2.019)		(-1.493)
Adjusted R-squared	0.999	0.999	0.999	0.999	0.999	0.999
LM (2)	3.955	2.171	2.656	2.468	2.789	2.829
	0.022	0.120	0.075	0.090	0.067	0.064
ARCH(1)	2.321	0.917	2.449	1.989	0.435	0.645
	0.131	0.341	0.121	0.162	0.511	0.424

*, **, and *** denote significance at 10, 5 and 1 percent, respectively. T-statistics in parentheses.

Notes: Dependent variable: real GDP. Figures for the LM and ARCH tests are F-statistics with p-values.

coefficients with a large magnitude. The large magnitude is due to the unit difference since the debt burden measures are in percent of disposable income, but all other variables are in terms of real dollars (millions).

We also controlled for the debt burden variables in model 3. They are reported as models 6 and 7 in table 5. Only the change in household debt and the level of net worth have significant coefficients among the household and debt service burden variables.[15]

In summary, regression analysis for the earlier period indicates no evidence that the household debt variables had any negative effect on output. However, according to the analysis for the later period, there is some evidence that the accumulation of household debt has negative effects on output.

3 Conclusion

Our empirical results indicate evidence of a structural change in the relationship of U.S. output to household debt. The Chow break tests indicate multiple breaks points, which we interpret as evidence for a gradual structural change due to financialization. Unit root tests for the separate samples showed that the data generating processes of the household variables are fundamentally different between the earlier and later periods. None of the household variables possesses a unit root in the earlier period, yet all of them do in the later period.

The ADL regression analysis for the whole sample period indicates that household financial variables in general have effects on output—including a negative effect of the level of household debt, as hypothesized. To account for structural change during the period of financial liberalization, we have divided the sample at the fourth quarter of 1982. In the ADL regression analysis for the earlier period, we found no evidence that the household debt variables had any negative effect on output. However, according to the regression analysis

[15]The coefficients on the level of household debt are again sensitive to the inclusion of a constant in the regressions. Without the constant, the variable has a significant negative coefficient in both models 6 and 7.

for the later period, there is evidence that the household indebtness has negative effects on output. Our results suggest structural differences between the earlier and later periods in the effect of household debt on the U.S. macroeconomy.

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A Data: Sources and Definitions

Sources:
BEA: Bureau of Economic Analysis
http://www.bea.gov
FED Flow of Fund: Federal Reserve Board Flow of Fund
http://www.federalreserve.gov/releases/z1/Current/data.htm

Variables	Source
Real GDP	BEA
Chain-type Price Index for PCE	BEA
Consumer Debt	FED Flow of Fund
Household Debt	FED Flow of Fund
Investment	BEA
FODSP	FED Flow of Fund
TDSP	FED Flow of Fund

PCE: personal consumption expenditures
FODSP: household financial obligations as a percent of disposable personal income
TDSP: household debt service payments as a percent of disposable personal income

Consumer debt is households and nonprofit organizations consumer credit liability from Federal Reserve statistical release Z.1, FED Flow of Funds. The identification number is Z1/Z1/LA153166000.Q for the seasonally adjusted.

Household debt is households and nonprofit organizations credit and equity market instruments liability from Federal Reserve statistical release Z.1, FED Flow of Funds. The identification number is Z1/Z1/LA154102005.Q for the seasonally adjusted.

Household net worth is households and nonprofit organizations net worth (market value) asset from Federal Reserve statistical release Z.1, Fed Flow of Funds. The identification number is Z.1:FL152090005.Q.

FODSP is seasonally adjusted and from Fed Flow of Fund. The identification number is FOR/FOR/DTFDpercentYPD.Q.

TDSP is seasonally adjusted and from Fed Flow of Fund. The identification number is FOR/FOR/DTFpercentYPD.Q.

Investment is the seasonally adjusted real fixed private investment data from the Bureau of Economic Analysis.